## AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all prior versions, and listings, of claims in the application:

## LISTING OF CLAIMS

1. [Cancelled] ~~A method for discriminating noise from signal in a noise-contaminated signal, comprising:~~

   ~~decomposing a frame of the noise-contaminated signal received in a predefined time period into decorrelated signal components;~~

   ~~for each component:~~

   ~~i) recursively updating respective parameters characterizing a Gaussian noise distribution and a signal distribution of the component as a function of time;~~

   ~~ii) using the respective parameters to evaluate a composite Gaussian and signal distribution function to provide an estimate of noise and signal contributions to the component; and~~

   ~~iii) attenuating the component in proportion to the estimated noise contribution to the component.~~

2. [Cancelled] ~~The method as claimed in claim 1 wherein the signal is a noise-contaminated voice signal and recursively updating comprises recursively updating respective parameters characterizing the Gaussian noise distribution and a Laplacian voice distribution.~~

3. [Cancelled] ~~The method as claimed in claim 1 wherein decomposing the frame comprises applying a matrix transform to the frame, which consists of a predefined number of samples.~~

4.      [Cancelled]   ~~The method as claimed in claim 3 wherein applying the matrix transform comprises mapping the frame of samples from a time domain to a frequency domain.~~

5.      [Cancelled]   ~~The method as claimed in claim 4 wherein mapping the frame comprises applying a discrete cosine transform to the frame of samples.~~

6.      [Cancelled]   ~~The method as claimed in claim 3 wherein applying the matrix transform comprises mapping the frame of samples to basis functions, which are the components.~~

7.      [Cancelled]   ~~The method as claimed in claim 6 wherein mapping the frame comprises decomposing the frame into at least one of wavelets and sinusoidal functions.~~

8.      [Cancelled]   ~~The method as claimed in claim 6 further comprising recomputing the basis functions to adaptively optimize decomposition.~~

9.      [Cancelled]   ~~The method as claimed in claim 8 wherein applying the matrix transform comprises applying an adaptive Karhunen-Loeve transform.~~

10.     [Cancelled]   ~~The method as claimed in claim 2 wherein recursively updating respective parameters comprises using a value computed during processing of a previous frame to select which of the parameters characterizing each distribution to update.~~

11.     [Cancelled]   ~~The method as claimed in claim 10 wherein the value computed during processing of a previous frame is an *a priori* probability that the frame constitutes noise, and using the *a priori* probability to select which of the parameters to update comprises:~~

        ~~selecting a measure of variance that characterizes the Gaussian noise distribution if the *a priori* probability is below a predetermined threshold; and~~

~~otherwise selecting a measure of variance factor that characterizes the Laplacian distribution.~~

12.     [Cancelled]     ~~The method as claimed in claim 11 wherein the *a priori* probability is defined by evaluating a hidden state of a hidden Markov model.~~

13.     [Cancelled]     ~~The method as claimed in claim 12 wherein recursively updating a parameter further comprises incrementally changing the parameter in accordance with a difference between an expected value of the component given the past value of the parameter, and the value of the component received.~~

14.     [Currently Amended]     ~~The method as claimed in claim 13 wherein incrementally changing the parameter comprises applying a first order smoothing filter to the components.~~ A method for discriminating noise from signal in a noise-contaminated signal, comprising:

decomposing a frame of the noise-contaminated signal received in a predefined time period into decorrelated signal components;

for each component:

i)     recursively updating respective parameters characterizing a Gaussian noise distribution and a signal distribution of the component as a function of time;

ii)     using the respective parameters to evaluate a composite Gaussian and signal distribution function to provide an estimate of noise and signal contributions to the component; and

attenuating the component in proportion to the estimated noise contribution to the component;

wherein the signal is a noise-contaminated voice signal and recursively updating comprises recursively updating respective parameters characterizing the Gaussian noise distribution and a Laplacian voice distribution;

wherein recursively updating respective parameters comprises using a value computed during processing of a previous frame to select which of the parameters characterizing each distribution to update;

wherein the value computed during processing of a previous frame is an *a priori* probability that the frame constitutes noise, and using the *a priori* probability to select which of the parameters to update comprises:

    i)    selecting a measure of variance that characterizes the Gaussian noise distribution if the *a priori* probability is below a predetermined threshold; and

    ii)    otherwise selecting a measure of variance factor that characterizes the Laplacian distribution;

wherein the *a priori* probability is defined by evaluating a hidden state of a hidden Markov model; and

wherein recursively updating a parameter further comprises incrementally changing the parameter in accordance with a difference between an expected value of the component given the past value of the parameter, and the value of the component received; and

wherein incrementally changing the parameter comprises applying a first order smoothing filter to the components

15.     [Original] The method as claimed in claim 14 wherein a time constant of the first order smoothing filter is chosen as a time during which the distribution is stationary.

16.     [Cancelled] ~~The method as claimed in claim 11 wherein using the respective parameters to determine which of the parameters to update comprises computing a measure of fit of the components to a composite Gaussian and Laplacian distribution.~~

17.     [Cancelled] ~~The method as claimed in claim 16 wherein using the respective parameters to determine which of the parameters to update further comprises:~~

computing a measure of fit of each of the received components to a respective Gaussian noise distribution defined using the respective parameters; and

comparing a mean of the measures of fit to the respective Gaussian noise distributions with a mean of the measures of fit to the composite Gaussian and Laplacian distributions, to compute a likelihood that the components of the frame constitute noise or noise-contaminated voice signal.

18. [Cancelled] The method as claimed in claim 17 wherein computing a measure of fit to either of the distributions comprises evaluating the distribution at the value of the component received.

19. [Currently Amended] The method as claimed in claim 18 wherein comparing a mean of the measures of fit comprises dividing a product of the measures of fit of the components to the composite Gaussian and Laplacian distribution by a product of the measures of fit of the components to the noise distribution A method for discriminating noise from signal in a noise-contaminated signal, comprising:

decomposing a frame of the noise-contaminated signal received in a predefined time period into decorrelated signal components;

for each component:

    i)    recursively updating respective parameters characterizing a Gaussian noise distribution and a signal distribution of the component as a function of time;

    ii)    using the respective parameters to evaluate a composite Gaussian and signal distribution function to provide an estimate of noise and signal contributions to the component; and

attenuating the component in proportion to the estimated noise contribution to the component;

wherein the signal is a noise-contaminated voice signal and recursively updating comprises recursively updating respective parameters characterizing the Gaussian noise distribution and a Laplacian voice distribution;

wherein recursively updating respective parameters comprises using a value computed during processing of a previous frame to select which of the parameters characterizing each distribution to update;

wherein the value computed during processing of a previous frame is an *a priori* probability that the frame constitutes noise, and using the *a priori* probability to select which of the parameters to update comprises:

    i)    selecting a measure of variance that characterizes the Gaussian noise distribution if the *a priori* probability is below a predetermined threshold; and

    ii)    otherwise selecting a measure of variance factor that characterizes the Laplacian distribution;

wherein using the respective parameters to determine which of the parameters to update comprises computing a measure of fit of the components to a composite Gaussian and Laplacian distribution;

wherein using the respective parameters to determine which of the parameters to update further comprises:

    i)    computing a measure of fit of each of the received components to a respective Gaussian noise distribution defined using the respective parameters; and

    ii)    comparing a mean of the measures of fit to the respective Gaussian noise distributions with a mean of the measures of fit to the composite Gaussian and Laplacian distributions, to compute a likelihood that the components of the frame constitute noise or noise-contaminated voice signal;

wherein computing a measure of fit to either of the distributions comprises evaluating the distribution at the value of the component received; and

wherein comparing a mean of the measures of fit comprises dividing a product of the measures of fit of the components to the composite Gaussian and Laplacian distribution by a product of the measures of fit of the components to the noise distribution.

20. [Original] The method as claimed in claim 19 wherein using the respective parameters to evaluate further comprises using the likelihood and the *a priori* probability to compute an *a posteriori* probability that the frame is noise-contaminated voice signal.

21. [Original] The method as claimed in claim 20 wherein using the respective parameters to evaluate further comprises using the *a posteriori* probability and a predefined fixed set of transition probabilities to compute an *a priori* probability that a next frame constitutes noise-contaminated voice signal.

22. [Cancelled] ~~The method as claimed in claim 1 wherein using the parameters to evaluate a composite Gaussian and signal distribution function comprises computing at least an approximation to an expected value of the composite Gaussian and signal distribution using a respective value of each component, and the parameters, to obtain a corresponding signal enhanced component, if it is determined that the frame is signal active.~~

23. [Currently Amended] ~~The method as claimed in claim 22 wherein computing at least an approximation comprises computing a piece-wise-function approximation of the expected value as a function of the parameters and the component.~~ A method for discriminating noise from signal in a noise-contaminated signal, comprising:

decomposing a frame of the noise-contaminated signal received in a predefined time period into decorrelated signal components;

for each component:

    i)     recursively updating respective parameters characterizing a Gaussian noise distribution and a signal distribution of the component as a function of time;

    ii)    using the respective parameters to evaluate a composite Gaussian and signal distribution function to provide an estimate of noise and signal contributions to the component.; and

attenuating the component in proportion to the estimated noise contribution to the component;

wherein using the respective parameters to evaluate a composite Gaussian and signal distribution function comprises computing at least an approximation to an expected value of the composite Gaussian and signal distribution using a respective value of each component, and the parameters, to obtain a corresponding signal-enhanced component, if it is determined that the frame is signal active; and

wherein computing at least an approximation comprises computing a piece-wise function approximation of the expected value as a function of the parameters and the component

24.    [Cancelled] ~~Apparatus for speech enhancement, comprising:~~

~~a signal transformer for decomposing a frame of samples of a noise-contaminated speech signal received in a predetermined time interval into decorrelated signal components;~~

~~a component-distribution parameter reviser for recursively updating respective parameters characterizing a Gaussian noise distribution and a Laplacian speech distribution of each of the respective components as a function of time;~~

~~a voice activity detector for determining whether the noise-contaminated speech signal is voice active in the time interval; and~~

a clean speech estimator for using composite Gaussian and Laplacian distributions defined with the parameters, and a respective value of each component to obtain a vector of speech-enhanced components, if it is determined by the voice-activity detector that the frame is voice active; and

an inverse signal transform for re-composing the frame of samples.

25.     [Cancelled]   The apparatus as claimed in claim 24 wherein the clean speech estimator computes an expected value of each of the composite Gaussian and Laplacian distributions to independently derive a speech-enhanced component corresponding to each of the components.

26.     [Cancelled]   The apparatus as claimed in claim 25 wherein the signal transform comprises means for decomposing the frame of samples using a discrete cosine transform.